

Statistical Consulting Report

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Statistical Liaison of CNR

Objective: To optimize the ratio of these three factors to hydrolyze lignin-cellulosic materials.
3 factors, FBU, XU, CBU.

	N*	N N1	P 0	P1	P*	
C	0	4.393398	15	25.6066		30
X	0	8.786797	30	51.2132		60
B	0	8.786797	30	51.2132		60

18 points	C as FPU	X as XU	B as CBU
OOO	15	30	30
OOO	15	30	30
OOO	15	30	30
PPP	25.607	51.213	51.213
PPN	25.607	51.213	8.787
PNP	25.607	8.787	51.213
PNN	25.607	8.787	8.787
NPP	4.393	51.213	51.213
NPN	4.393	51.213	8.787
NNP	4.393	8.787	51.213
NNN	4.393	8.787	8.787
0(N*)0	15	0	30
0(P*)0	15	60	30
OO(N*)	15	30	0
OO(P*)	15	30	60
(N*)OO	0	30	30
(P*)OO	40	30	30

1	10	10	10		1	12	12	12
2	20	10	10		2	18	12	12
3	10	20	10		3	12	18	12
4	20	20	10		4	18	18	12
5	10	10	20		5	12	12	18
6	20	10	20		6	18	12	18
7	10	20	20		7	12	12	18
8	20	20	20		8	18	18	18
9	6.6	15	15	*	9	10	15	15
10	23.4	15	15	*	10	20	15	15
11	15	6.6	15	*	11	15	10	15
12	15	23.4	15	*	12	15	20	15
13	15	15	6.6	*	13	15	15	10
14	15	15	23.4	*	14	15	15	20
15	15	15	15		15	15	15	15
16	15	15	15		16	15	15	15
17	15	15	15		17	15	15	15
18	15	15	15		18	15	15	15
19	15	15	15		19	15	15	15
20	15	15	15		20	15	15	15

10=low, 20=High settings. X1, X2, X3 are factors...

Treatments 1 to 8 in each case are the factorial points in the design;

Treatments 9 to 14 are the star points;

Treatments 15 to 20 are the system-recommended center points

In the CCC design how the low and high values of each factor have been extended to create the star points.

In the CCI design, the specified low and high values become the star points, and the system computes appropriate settings for the factorial part of the design inside those boundaries

CCC designs provide high quality predictions over the entire design space, but require factor settings outside the range of the factors in the factorial part. **Note:** When the possibility of running a CCC design is recognized before starting a factorial experiment, factor spacing can be reduced to ensure that $\pm \alpha$ for each coded factor corresponds to feasible (reasonable) levels.

The CCF design does not allow orthogonal blocking and the Box-Behnken designs offer blocking only in limited circumstances, whereas the **CCC does permit orthogonal blocking.**

Add center points

We add center point runs interspersed among the experimental setting runs for two purposes:

1. To provide a measure of process stability and inherent variability
2. To check for curvature.

As a rough guide, you should generally add approximately 3 to 5 center point runs to a full or fractional factorial design.

Suggested design:

Prepare a worksheet and replace 0, -1 and 1 with original factor levels.

Add a column for yield (Y).

Pattern	Block	FBU	XU	CBU	Comment	Y
---	1	-1	-1	-1	Full Factorial	Y1
+++	1	-1	1	1	Full Factorial	Y2
++-	1	1	-1	1	Full Factorial	Y3
+-+	1	1	1	-1	Full Factorial	Y4
0	1	0	0	0	Center-Full Factorial	Y5
0	1	0	0	0	Center-Full Factorial	Y6
---	2	-1	-1	1	Full Factorial	Y7
+-	2	-1	1	-1	Full Factorial	Y8
++	2	1	-1	-1	Full Factorial	Y9
+++	2	1	1	1	Full Factorial	Y10
0	2	0	0	0	Center-Full Factorial	
0	2	0	0	0	Center-Full Factorial	
0	3	-1.414	0	0	Axial	
0	3	1.414	0	0	Axial	
0-0	3	0	-1.633	0	Axial	
0+0	3	0	1.633	0	Axial	
00-	3	0	0	-1.633	Axial	
00+	3	0	0	1.633	Axial	
0	3	0	0	0	Axial	
0	3	0	0	0	Axial	
0	3	0	0	0	Center-Full Factorial	